

*Excellence in Electronics***TYPE**  
**CK5784WB**

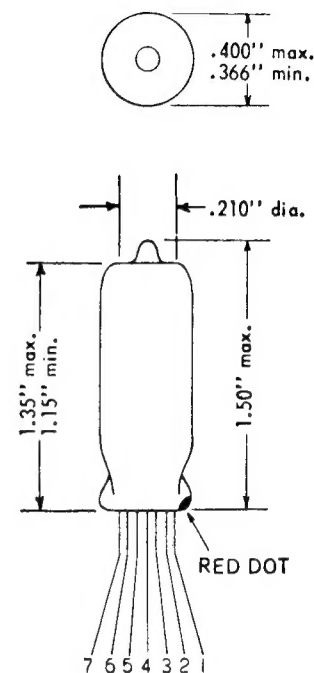
The CK5784WB is a heater-cathode type pentode of subminiature construction capable of operation in the VHF region. The control grid and suppressor grid may be used as independent control electrodes for circuits such as gated amplifiers, mixers, and gain controlled amplifiers. This tube is characterized by long life and stable performance. It is designed for service where severe conditions of high temperature and mechanical shock or vibration are encountered. The flexible terminal leads may be soldered or welded directly to the terminals of circuit components without the use of sockets. Standard inline subminiature sockets may be used by cutting the leads to a suitable length.

**MECHANICAL DATA**ENVELOPE: T-3 GlassBASE: None (0.016" tinned flexible leads. Length: 1.5" min.  
Spacing: (0.048" center-to-center)TERMINAL CONNECTIONS: (Red Dot is adjacent to lead 1)

Lead 1 Plate	Lead 5 Grid #1
Lead 2 Grid #2	Lead 6 Cathode
Lead 3 Heater	Lead 7 Grid #1
Lead 4 Heater	

MECHANICAL RATINGS:

Maximum Impact Acceleration (Shock Test - Note 3)	450 G
Maximum Uniform Acceleration (Centrifuge Test - Note 4)	1000 G
Maximum Vibrational Acceleration (96 Hour Fatigue Test - Note 5)	2.5 G
Maximum Bulb Temperature	220 °C

MOUNTING POSITION: Any**ELECTRICAL DATA**

CAUTION-----To Electronic Equipment Design Engineers: Special attention should be given to the temperature at which the tubes are to be operated. Reliability will be seriously impaired if maximum bulb temperature is exceeded. The life expectancy may be reduced if conditions other than those specified for life test are imposed on the tube and will be reduced appreciably if maximum ratings are exceeded. Life and reliability of performance are closely related to the degree that regulation of the heater voltage is maintained at its center rated value.

RATINGS AND NORMAL OPERATION:	MIL-E-1 SYMBOL	DESIGN MINIMUM	NORMAL TEST CONDITIONS (Note 7)	NORMAL OPERATION (Note 6)	DESIGN MAXIMUM	MIL-E-1 UNITS
Heater Voltage (Note 8)	Ef:	5.7	6.3	6.3	6.9	V
Plate Voltage	Eb:	----	120	120	165	Vdc
Grid #1 Voltage	Ec1:	-55	0	0	0	Vdc
Grid #2 Voltage	Ec2:	----	120	120	155	Vdc
Grid #3 Voltage	Ec3:	-55	0	0	30	Vdc
Plate Dissipation	Pp:	----	----	0.65	0.79	W
Grid #2 Dissipation	Pg2:	----	----	0.5	0.6	W
Grid #1 Circuit Resistance	Rg1:	----	----	1.0	1.2	Meg.
Heater-Cathode Voltage	Ehk:	-200	----	100	+200	v
Cathode Current	I <sub>k</sub> :	----	----	----	16.5	mA <sub>dc</sub>
Grid #1 Current	I <sub>c1</sub> :	----	----	----	1.0	mA <sub>dc</sub>
Grid #3 Current	I <sub>c3</sub> :	----	----	----	0.2	mA <sub>dc</sub>
Cathode Resistance	R <sub>k</sub> :	----	230	230	----	ohms
Plate Current (I)	I <sub>b</sub> (I):	----	----	5.5	----	mA <sub>dc</sub>
Grid #2 Current	I <sub>c2</sub> :	----	----	4.1	----	mA <sub>dc</sub>
Transconductance (I)	S <sub>m</sub> (I):	----	----	3200	----	μmhos

Tentative Data

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RECEIVING AND CATHODE RAY TUBE OPERATIONS



## RELIABLE SUBMINIATURE PENTODE

## ELECTRICAL DATA (Cont'd)

## CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1)

TEST	CONDITIONS	AQL %	MIL - E - 1 SYMBOL	MIN	LAL	BOGIE	UAL	MAX	ALD	MIL - E - 1 UNITS
<b>MEASUREMENTS ACCEPTANCE TESTS PART 1</b>		<b>Combined AQL=1.0% excluding Mechanical and Inoperatives</b>								
Heater Current:		0.65	If:	190	----	200	----	210	----	mA
Heater - Cathode Leakage:	Ehk=+100 Vdc Ehk=-100 Vdc	0.65	lhk: lhk:	----	----	----	----	5 5	----	$\mu$ Adc $\mu$ Adc
Grid Current (1):		0.65	Ic1 (1):	----	----	----	----	-0.3	----	$\mu$ Adc
Plate Current (1):		0.65	Ib (1):	3.9	4.8	5.5	6.2	7.1	2.5	mA
Transconductance (1):		0.65	Sm (1):	2650	2900	3200	3500	3950	900	$\mu$ mhos
Continuity and Shorts (Inoperatives):		0.4	----	----	----	----	----	----	----	----
Mechanical:	Envelope (9-7) (Note 10)									
<b>MEASUREMENTS ACCEPTANCE TEST PART 2</b>										
Insulation of Electrodes:	Ef=6.3V Eg1-all=-100 Vdc Eg3-all=-100 Vdc Ep-all=-300 Vdc	2.5	Rg1-all: Rg3-all: Rp-all:	100 100 100	----	----	----	----	----	Meg. Meg. Meg.
Plate Current (2):	Ec3=-10 Vdc (Note 14)	2.5	Ib (2):	----	----	----	----	200	----	$\mu$ Adc
Plate Current (3):	Ec3=-6 Vdc (Note 14)	2.5	Ib (3):	5	----	----	----	----	----	$\mu$ Adc
Plate Current (4):	Ec1=-9 Vdc	2.5	Ib (4):	----	----	----	----	200	----	$\mu$ Adc
Plate Current (5):	Ec1=-5 Vdc	2.5	Ib (5):	5	----	----	----	----	----	$\mu$ Adc
Screen Current:		2.5	Ic2:	2.8	----	----	----	5.4	----	mA
Transconductance (2):	Ef=5.7V (Note 9)	2.5	$\Delta_{EF} S_{m(2)}$	----	----	----	----	10	----	%
Grid Emission:	Ef=7.5V; preheat 5 minutes at Ec1=0; Test at Ec1=-10 Vdc	6.5	Ic1 (2):	----	----	----	----	-0.5	----	$\mu$ Adc
AF Noise:	Esig=70 mVac; Ec2=19 Vdc; Rg1=0.1 Meg; Rg2=1000 ohms; Rp=0.2 Meg; Ck=1000 $\mu$ f	2.5	EB:	----	----	----	----	17	----	VU
Capacitance:	(Note 2)	6.5	Cg1p:	----	----	----	----	0.03	----	$\mu$ f
Capacitance:			Cin:	3.5	----	4.5	----	5.5	----	$\mu$ f
Capacitance:			Cout:	2.8	----	3.6	----	4.4	----	$\mu$ f
Transconductance (3):	Ec3=-1.0 Vdc (Note 14)	6.5	Sg3-P:	400	----	----	----	1100	----	$\mu$ mhos
Transconductance (4):	Ec3=+22 Vdc (Note 14)	6.5	Sg3-P:	----	----	----	----	25	----	$\mu$ mhos
Low Pressure Voltage Breakdown:	Pressure=55 $\pm$ 5 mm Hg; Voltage=300 Vac	6.5	----	----	----	----	----	----	----	----
Operation Time:	(Note 11)	4.0	t:	----	----	----	----	20	----	sec.
Vibration (2):	F=40 cps; G=15; Rp=10,000 ohms	2.5	Ep:	----	----	----	----	75	----	mVac
Vibration (3):	F=30-1000 cps; G=15; Rp=10,000 ohms; t=3 minutes; positions X <sub>1</sub> and X <sub>2</sub> only	4.0	Ep:	----	----	----	----	300 peak to peak	----	mv
<b>DEGRADATION RATE ACCEPTANCE TESTS</b>										
Subminiature Lead Fatigue:		2.5	----	4.0	----	----	----	----	----	arcs
Shock (1):	Ehk=+100 Vdc; Rg=0.1 Meg. Hammer Angle=30° (Note 3)	20	----	----	----	----	----	----	----	----
Fatigue (1):	96 hours; G=2.5; Fixed frequency; F=25 min., 60 max. (Note 5)	6.5	----	----	----	----	----	----	----	----
Fatigue (2):	6 hours; G=10; Fixed frequency; F=25 min., 60 max. (Note 12)	6.5	----	----	----	----	----	----	----	----

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RECEIVING AND CATHODE RAY TUBE OPERATIONS



## RELIABLE SUBMINIATURE PENTODE

## ELECTRICAL DATA (Cont'd)

## CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL - E - 1 SYMBOL	MIN	MAX	MIL - E - 1 UNITS	Allowable Defects per Characteristic 1st Sample Combined Samples
<b>DEGRADATION RATE ACCEPTANCE TESTS</b>							
Post Shock (1) and Fatigue Tests (1) and (2) End Points:							
Vibration (2):	F=40 cps; G=15; Rp= 10,000 ohms	----	Ep:	----	125	mVac	
Heater - Cathode Leakage:	Ehk=+100 Vdc Ehk=-100 Vdc	----	lhk: lhk:	----	20 20	$\mu$ Adc $\mu$ Adc	
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	$\Delta_f$ Sm (1):	----	15	%	
Grid Current (1):		----	lc1 (1):	----	-1.0	$\mu$ Adc	
Shock (2):	Ehk=+100 Vdc; Rg=0.1 Meg.; G=75; (hammer angle=120° + rubber pad); t=10 milliseconds duration (Note 13)	20	----	----	----	----	
Post Shock Test (2) End Points:							
Vibration (2):	F=40 cps; G=15; Rp= 10,000 ohms	----	Ep:	----	125	mVac	
Heater - Cathode Leakage:	Ehk=+100 Vdc Ehk=-100 Vdc	----	lhk: lhk:	----	20 20	$\mu$ Adc $\mu$ Adc	
Change in Transconductance (1) of individual tubes:	Ef=6.3 V	----	$\Delta_f$ Sm (1):	----	15	%	
Grid Current (1):		----	lc1 (1):	----	-1.0	$\mu$ Adc	
Glass Strain (Thermal Shock):		6.5	----	----	----	----	
<b>ACCEPTANCE LIFE TESTS</b>							
Heater Cycle:	Ef=7.5 V; Eb=Ec1=Ec2= Ec3=0 V; Ehk=140 Vac; 1 min. on, 1 min. off.	1.0	----	2000	----	cycles	
Heater Cycling Life Test End Points:							
Heater - Cathode Leakage:	Ehk=+100 Vdc Ehk=-100 Vdc	----	lhk: lhk:	----	20 20	$\mu$ Adc $\mu$ Adc	
1 Hour Stability Life Test:	TA=room; Ehk=+200 Vdc; Rg1=1.0 Meg.	----	----	----	----	----	
1 Hour Stability Life Test End Points:							
Change in Transconductance (1) of individual tubes:	(Typical sample size=50 tubes)	1.0	$\Delta_f$ Sm (1):	----	10	%	
100 Hour Survival Rate Life Test:	TA=room; Ehk=+200 Vdc; Rg1=1.0 Meg.	----	----	----	----	----	
100 Hour Survival Rate Life Test End Points:	(Typical sample size=200 tubes)	----	----	----	----	----	
Inoperatives:		0.65	----	----	----	----	
Transconductance (1):		1.0	Sm (1):	2400	----	$\mu$ mhos	
Intermittent High Temperature Life Tests:	T Bulb=220°C; Ehk= +200 Vdc; Rg1=1.0 Meg.	----	----	----	----	----	



## RELIABLE SUBMINIATURE PENTODE

## ELECTRICAL DATA (Cont'd)

## CHARACTERISTICS AND QUALITY CONTROL TESTS (Note 1) (cont'd)

TEST	CONDITIONS	AQL %	MIL - E - 1 SYMBOL	MIN	MAX	MIL - E - 1 UNITS	Allowable Defects per Characteristic 1st Sample	Combined Samples
ACCEPTANCE LIFE TESTS ( cont 'd )								
500 Hour Intermittent High Temperature Life Test End Points:	(Typical sample size= 20 tubes 1st sample, 40 tubes 2nd sample)	----	----	----	----	----		
Inoperatives:		----	----	----	----	----	1	3
Grid Current (1):		----	I <sub>c</sub> (1):	----	-0.6	μAdc	1	3
Heater Current:		----	I <sub>f</sub> :	188	212	mA	1	3
Change in transcon- ductance (1) of individ- ual tubes:		----	Δ <sub>f</sub> S <sub>m</sub> (1):	----	20	%	1	3
Transconductance (2):	(Note 9)	----	Δ <sub>E<sub>f</sub></sub> S <sub>m</sub> (2):	----	15	%	2	5
Heater -Cathode	E <sub>hk</sub> =+100 Vdc	----	I <sub>hk</sub> :	----	10	μAdc	2	5
Leakage:	E <sub>hk</sub> =-100 Vdc	----	I <sub>hk</sub> :	----	10	μAdc		
Insulation of Electrodes:								
g1-all		----	R <sub>g1</sub> -all:	50	----	Meg.	2	5
g3-all		----	R <sub>g3</sub> -all:	50	----	Meg.		
p-all		----	R <sub>p</sub> -all:	50	----	Meg.		
Transconductance (1) Average Change:		----	Avg Δ <sub>f</sub> S <sub>m</sub> (1):	----	15	%	---	---
Total Defectives:		----	----	----	----	----	4	8
1000 Hour Intermittent High Temperature Life Test End Points:	(Typical Sample Size= 20 tubes 1st sample, 40 tubes 2nd sample)	----	----	----	----	----	---	---
Inoperatives:		----	----	----	----	----	2	5
Grid Current (1):		----	I <sub>c</sub> (1):	----	-1.0	μAdc	2	5
Heater Current:		----	I <sub>f</sub> :	188	212	mA	2	5
Change in transcon- ductance (1) of in- dividual tubes:		----	Δ <sub>f</sub> S <sub>m</sub> (1):	----	25	%	2	5
Heater -Cathode	E <sub>hk</sub> =+100 Vdc	----	I <sub>hk</sub> :	----	15	μAdc	2	5
Leakage:	E <sub>hk</sub> =-100 Vdc	----	I <sub>hk</sub> :	----	15	μAdc		
Total Defectives		----	----	----	----	----	5	10

## NOTES

Note 1: Characteristics, Quality Control Test Procedures, and Inspection Levels are made according to the appropriate paragraphs of MIL-E-1 "Inspection Instructions for Electron Tubes" and MIL-STD-105A.

Note 2: With a cylindrical shield (0.405" I.D. - 1 7/8" long) connected to lead 6.

Note 3: Test conditions and acceptance criteria per Shock Test Procedures of MIL-E-1 basic specification.

Note 4: Centrifuge Test with forces applied in any direction.

Note 5: Test conditions and acceptance criteria per Fatigue Test Procedures of MIL-E-1 basic specifications.

Note 6: These normal values represent conditions at which control of reliability may be expected.

Note 7: These normal test conditions are used for all characteristic tests unless otherwise stated under the individual test item.

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## RELIABLE SUBMINIATURE PENTODE

## ELECTRICAL DATA (Cont'd)

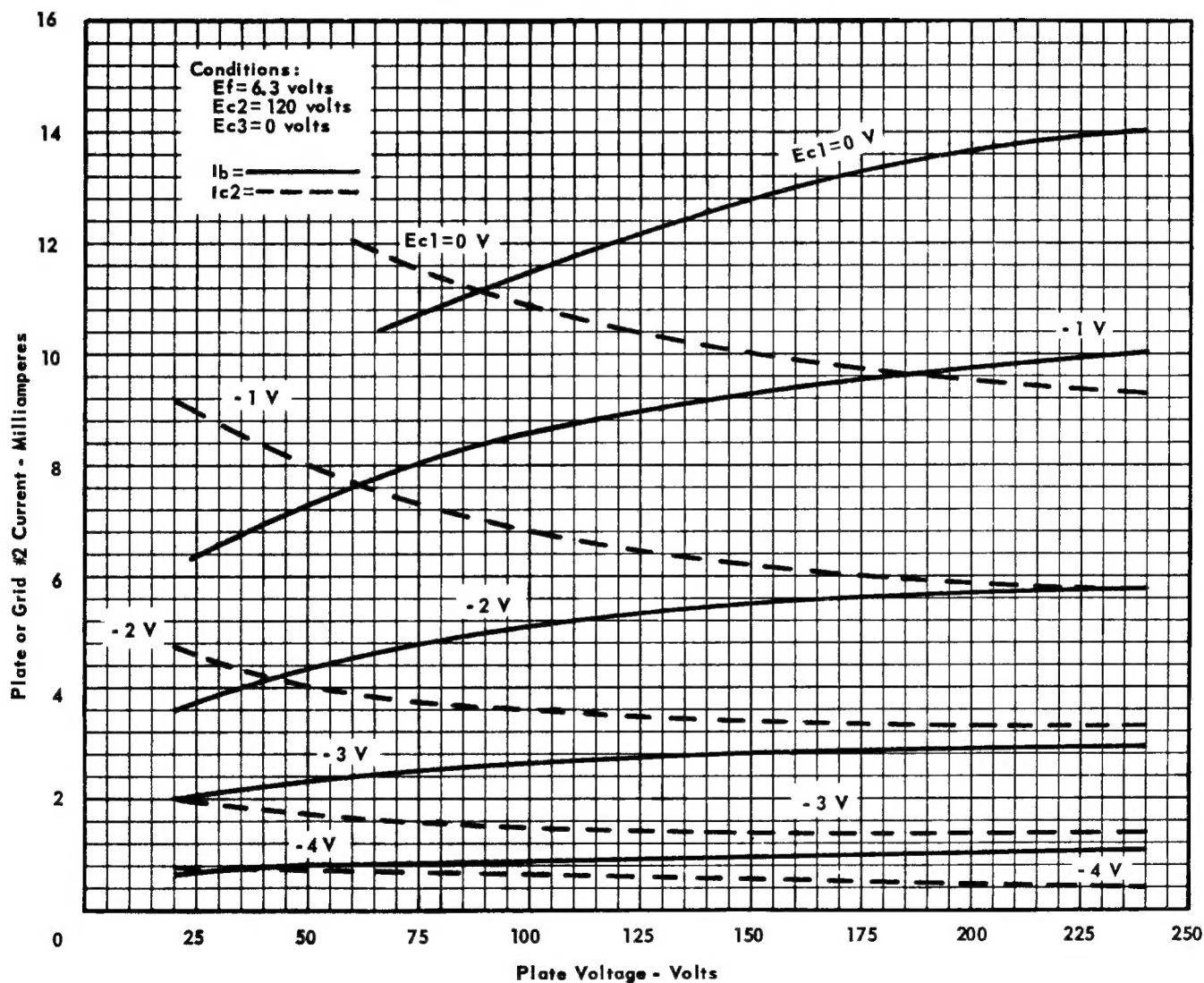
## NOTES (cont'd)

- Note 8: For most applications the performance will not be adversely affected by  $\pm 10\%$  heater voltage variation, but when the application can provide a closer control of heater voltage, an improvement in reliability will be realized.
- Note 9: Change of transconductance for individual tubes from that value measured at  $E_f = 6.3$  V to that value measured at  $E_f = 5.7$  V.
- Note 10: In addition to meeting the tightened electrical, physical and mechanical tests described in this data sheet Raytheon Reliable Tubes are now guaranteed to be free from "potential" defects identifiable by microscopic inspection as described by appendix B of "Inspection Instructions for Electron Tubes."
- Note 11: Operation time is the time in seconds required for the plate current to attain a value within plus or minus 10 percent of the three minute plate current (1) value using a cold tube. No preheating before this test will be allowed.
- Note 12: The tubes shall be rigidly mounted on a table vibrating with simple harmonic motion. The tubes shall be vibrated for a total of 6 hours, 2 hours in each of three positions, X1, X2 and Y1. Only rated heated voltage shall be applied. Tubes which show one or more of the following defects shall be considered failures.
- (a) Tubes which show permanent or tap shorts or open circuits following fatigue test, when tested as specified in 4.7.2 and 4.7.3.
  - (b) Tubes which do not comply with post fatigue limits. This is a destructive test.
- Note 13: The provisions of paragraph 4.9.20.5 of Specification MIL-E-1 shall apply, except for test conditions listed for shock test (2).
- Note 14: The reference point for  $E_{c3}$ , on this test, shall be the negative side of the cathode resistor.



## RELIABLE SUBMINIATURE PENTODE

AVERAGE PLATE CHARACTERISTICS

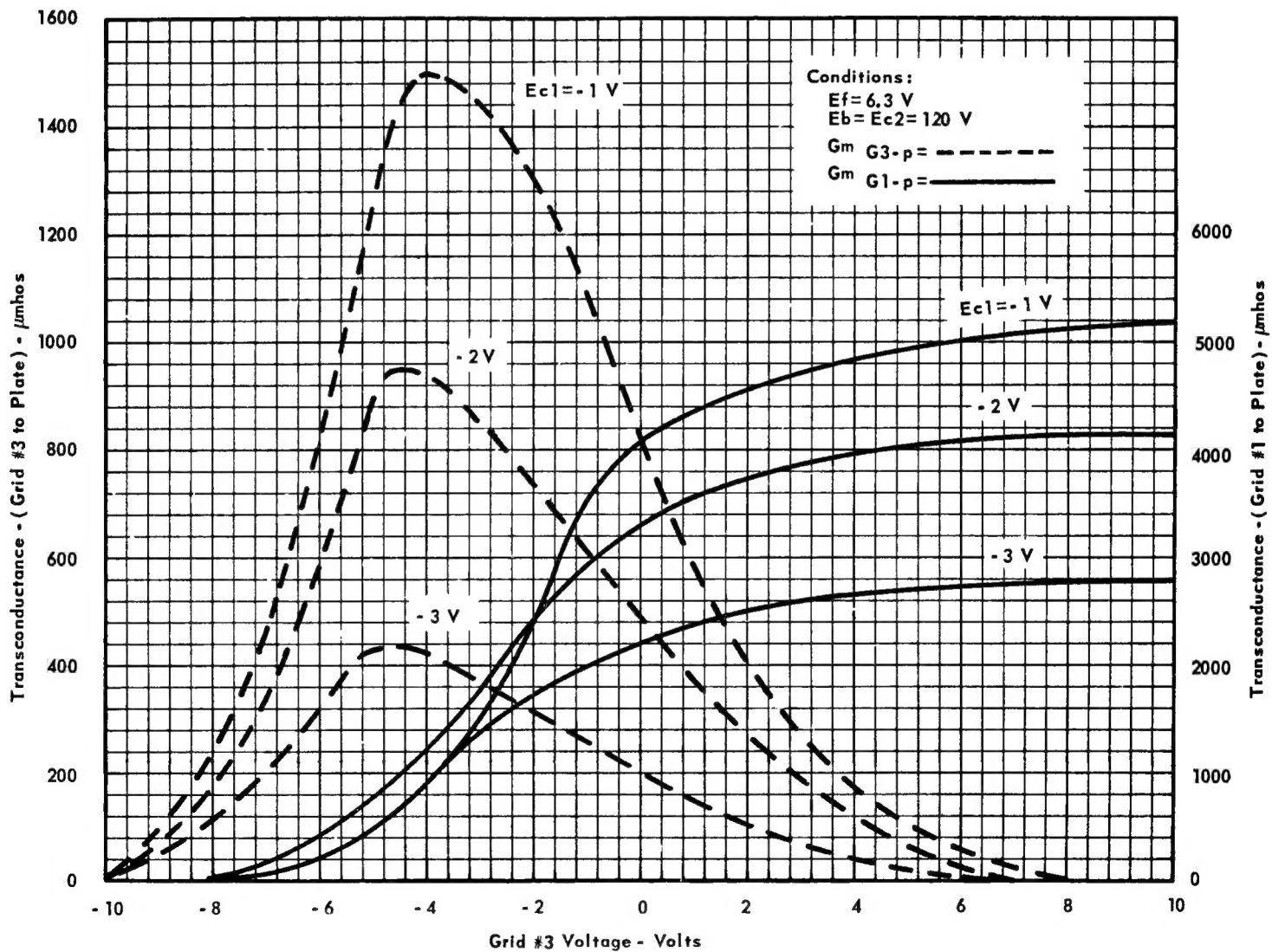


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## RELIABLE SUBMINIATURE PENTODE

## AVERAGE CHARACTERISTICS

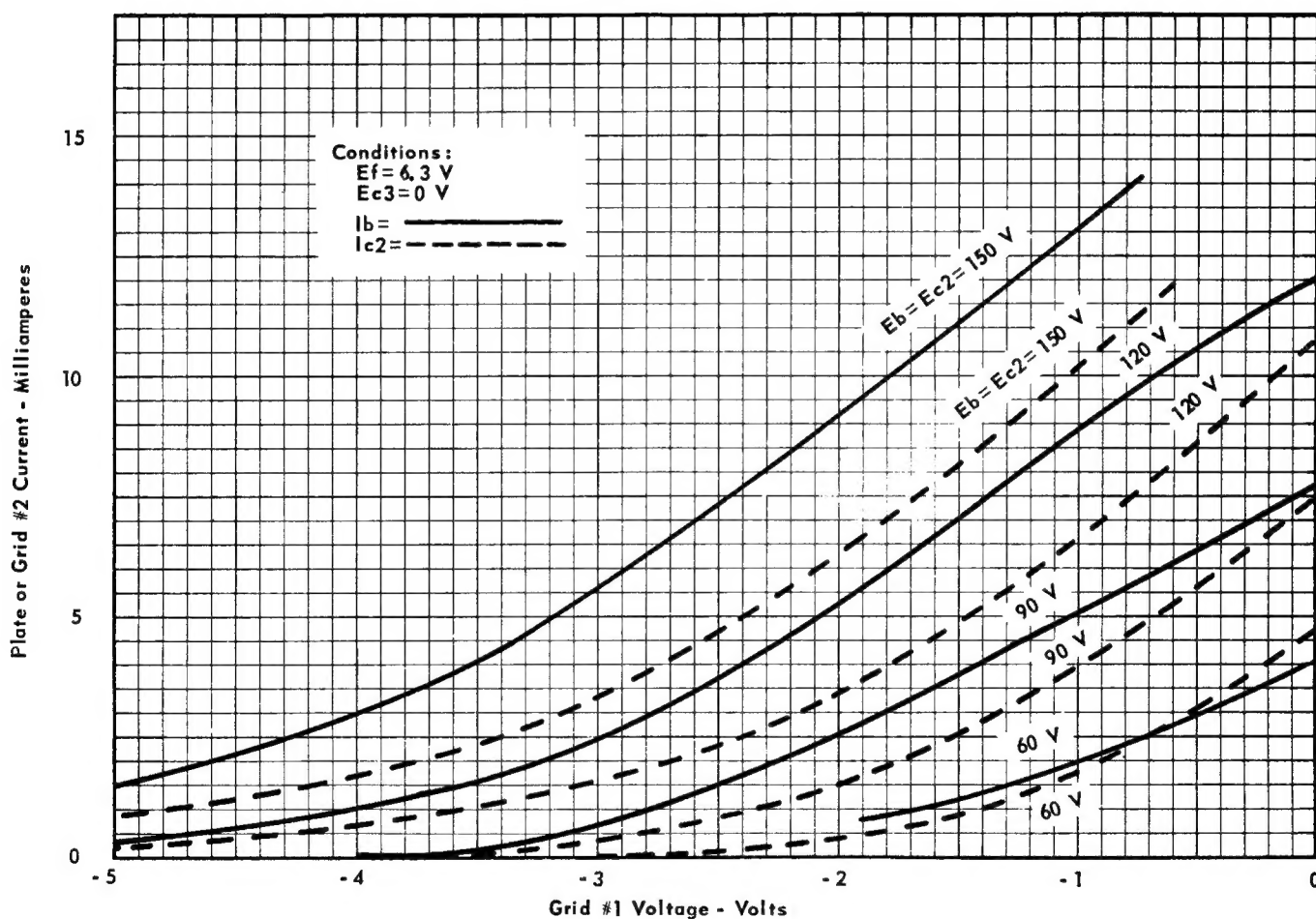






## RELIABLE SUBMINIATURE PENTODE

AVERAGE CHARACTERISTICS



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## RELIABLE SUBMINIATURE PENTODE

